REMARKS

The applicant will sequentially address the issues raised by the Examiner. The paragraph numbers correspond to those of the Examiner's Office Action for ease of reference.

Claim Rejections - 35 U.S.C. § 112

3./4. The Examiner rejected claims 7 and 15 under 35 U.S.C. § 112, first paragraph, as being non-enabling as to how to make and/or use the optical micro-electromechanical device to be configured/operated as a laser. The Examiner also rejected claim 7 as being indefinite under 35 U.S.C. § 112, second paragraph. The Examiner stated that use of the language "configured" in claim 7 was "indefinite and fails to particularly point out and distinctly claim the subject matter which applicant regards as the invention."

As described in the specification, "[o]ptical filtering is often achieved through the use of a Fabry-Perot cavity. In its simplest form, a Fabry-Perot cavity consists of two mirrors separated by an air gap. . . For high-quality filter design, Distributed Bragg Reflectors (DBRs) are grown into the crystal to act as mirrors. These consist of alternating layers of high and low index of refraction materials with an optical thickness of one-quarter of the wavelength of interest." (Page 12, line 28 to page 13, line 4). Further, the specification discloses that, "the wafer of Figure 9 may be modified to include a Lambda cavity above the first DBR pair that is on top of the GaAs substrate. Within the Lambda cavity is an active layer. On top of the lambda cavity is an oxidation layer. An additional DBR pair is then positioned on the oxidation layer. The three DBR pairs are doped to provide an N-P-N or P-N-P structure. <u>This configuration can be used to form a laser</u>. Previously cited <u>U.S. Patent 6,026,108 describes structures that may be utilized in accordance with the invention</u>." (Page 16, lines 1-7, emphasis added).

"The specification is enabling if it enables those skilled in the art, to carry out the aspect proper to their specialty." *M.P.E.P.* § 2164.05(b). As quoted above, the specification specifically discloses how the structures shown in the figures and described in the specification may be configured as a laser. Also, the '108 patent cited in the present specification, a "Vertical-Cavity Surface-Emitting Laser with an Intracavity Quantum-Well Optical Absorber," demonstrates that one with ordinary skill in the art of designing VCSEL lasers and detectors would understand how to make and or use the present invention as a laser

(and also as an optical detector). For example, the '108 patent discloses that the device consists of DBR pairs that are configured to either emit light through the top or bottom of the device, and that "the device operates in a manner that is consistent with existing VCSEL devices." (See col. 6, lines 32-42). Additionally, several studies have been performed regarding electrostatically actuated cantilever structures, as well as vertical-cavity surface-emitting lasers, as cited in the Provisional Application No. 60/205,967, and the Master of Science Thesis entitled "Design and Properties of Torsional Micromechanical Tunable Optical Filter," by Waite (Fall 2000) cited in a previous Information Disclosure Statement on December 21, 2001.

The structure disclosed in the present application is suitable for use both as a laser and as an optical detector. Furthermore, the portion of the structure in the substrate is well known to those skilled in the art of making VCSEL lasers and optical detectors. In addition, Fabry-Perot cavities formed by two mirrors separated by an air gap are well known in the art. The present application was written with the assumption that the reader would be familiar with the structures and operation of conventional VCSEL lasers and optical detectors as well as Fabry-Perot cavities.

Thus, it is clear that the present application is sufficiently enabling as how to make and/or use the optical micro-electromechanical device to be configured/operated as a laser. Additionally, with respect to the § 112, second paragraph rejection, the Applicants respectfully submit that it is clear how the optical electromechanical device can be configured as a laser based on the aforementioned discussion. Accordingly, claims 7 and 15 meet the requirements of 35 U.S.C. § 112 and are in condition for allowance.

Claim Rejections - 35 U.S.C. § 102

5./6. The Examiner Rejected claims 1-7, 12-15, and 20-29 under 35 U.S.C. 102(a) as being anticipated by the Master of Science Thesis entitled "Design and Properties of Torsional Micromechanical Tunable Optical Filter," by Waite (Fall 2000) (hereinafter, "Thesis").

The Examiner's rejection is respectfully traversed because 35 U.S.C. § 102(a) is an improper basis for a rejection. Under 35 U.S.C. § 102(a), an invention is anticipated when "the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant

for patent." Furthermore, an "[a]pplicant's disclosure of his or her own work within the year before the application filing date cannot be used against him or her under 35 U.S.C. § 102(a)." *M.P.E.P.* 2132.01 (citing *In re Katz*, 687 F.2d 450 (CCPA 1982)). Jeffrey Michael Waite is a named inventor of the present application as well as the author of the Thesis, and so there is no anticipation under § 102(a). Additionally, the present application claims priority on Provisional Application 60/205,967 with a filing date of May 19, 2000. The Provisional Application provides an enabling disclosure of the invention claimed in this application. Since the date of publication of the Thesis ("Fall 2000") is after the filing date of the Provisional Application upon which the present application claims priority, the Thesis cannot be a proper basis for an anticipation rejection.

Because the Thesis is an improper basis for a rejection under 35 U.S.C. 102(a), the Thesis cannot anticipate any of the claims of the present application.

7. The Examiner rejected claims 1, 3, 12, 20, and 24 under 35 U.S.C. § 102(e) as being anticipated by U.S. Pat. No. 6,000,280 to Miller et al. (hereinafter "Miller"). Miller discloses "Drive Electrodes for Microfabricated Torsional Cantilevers," which comprises a cantilever moment arm 12, torsional support beam 16, a counterweight 26, a substrate 18, and connectors 76-79,80-83. Also, Miller discloses that the cantilever arm, torsional support beam, and counterweight are suspended above the substrate. Finally, Miller discloses a cantilever arm capable of carrying a mirror, wherein the cantilever is capable of pivoting about the torsional support beam when a potential is applied to fixed electrodes.

Claims 1, 12, 25, and 29 have been amended to more distinctly claim the subject matter of the present invention. The amended independent claims disclose a substrate and a mirror that together form a Fabry-Perot cavity. Miller neither discloses a Fabry-Perot cavity or a second mirror mounted on the substrate capable of forming a Fabry-Perot cavity.

The applicant further asserts that Miller cannot be fairly combined with any other VCSEL prior art publication, unless the VCSEL prior art publication were to provide a basis or motivation for making such a combination, because there is no indication in Miller that the Miller cantilever structure would be suitable for use in a VCSEL laser or in any other Fabry-Perot cavity structure.

Because neither Miller nor the other the other prior art or record teaches or suggests a micro-electromechanical device comprising a substrate and cantilevered mirror assembly, wherein the substrate and mirror assembly form a Fabry-Perot cavity and the mirror assembly includes a counterweight, it is respectfully submitted that independent claims 1, 12, 25, and 29 are in condition for allowance, as well as all dependent claims that depend thereon.

Request for Reinstatement of Nonelected Claims per MPEP 812.02

While the Applicant made a restriction election, the Applicant nevertheless retains the right to request reinstatement of non-elected claims that depend from generic claims that have been allowed. See MPEP 821.02

> ... However, where the application contains an allowed generic claim, and applicant has not been previously notified as to the allowance of a generic claim, the examiner must, prior to canceling the nonelected claims, notify applicant of the allowance of a generic claim and give applicant a time limit of 1-month (not less than 30 days) to conform all of the claims to the nonelected species to fully embrace an allowed generic claim. See MPEP § 809.02(c).

If claims 1 and 12 are allowed, applicant requests that the Examiner give applicant an opportunity to resubmit non-elected claims 8-11 and 16-19.

Objection to the Drawings

8. Finally, the Examiner objected to the drawings, and in particular requested that a proposed drawing correction or corrected drawing showing the laser, optical detector, optical filter, optical amplifier, and optical attenuator, be submitted or that these features be canceled from the claims.

This objection is respectfully traversed because the Fabry-Perot cavity structures shown in the drawings can be operated as a laser, detector, optical filter, optical amplifier or optical attenuator. No additional drawings are needed, because the structures shown in the drawings can be implemented so as to operate in these different modes. This is disclosed in the specification at pages 3/19-21 and 15/30 to 16/10.

In addition, the Examiner has withdrawn claims 8-11 and 16-19, which cover the optical detector, optical filter, optical amplifier, and optical attenuator. However, if these claims were to be re-instated, then the Examiner's objection to the drawings and this discussion remain relevant.

The current specification describes how the device may be configured to function as a laser. For example, Figures 7A-7C illustrate a second set of contacts 60A-60B, which "allow the device to operate as a tunable vertical-cavity surface emitting laser (VCSEL)." (See page 12, lines 11-12 of specification). The second set of contacts used in conjunction with a bottom mirror 52 and air gap forms a Fabry-Perot cavity, which is well known in the art to be capable of functioning as a laser. Additionally, Figures 9 and 10 show that DBR pairs may be configured to form a laser. (See page 16, lines 1-7 of the specification). This is also well known and would be evident to one of ordinary skill in the art.

Thus, with respect to the objection to the drawings, the Applicants respectfully submit that no new or corrected drawings are required because all claimed structures and features are shown in the drawings.

CONCLUSION

In light of the above amendments and remarks, the Applicants respectfully request that the Examiner reconsider this application with a view towards allowance. The Examiner is invited to call the undersigned attorney if a telephone call could help resolve any remaining items.

Respectfully submitted,

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Gary S. Williams 31,066 (Reg. No.)

PENNIE & EDMONDS LLP
3300 Hillview Avenue
Palo Alto, California 94304
(650) 493-4935

Appendix A

Marked-up Version of Revised Claims

1. (amended) An optical micro-electromechanical device, comprising:

a substrate; and

a mirror assembly suspended above said substrate, <u>said substrate and said mirror together forming a Fabry-Perot cavity,</u> said mirror assembly including:

a torsional beam attached to said substrate,

a cantilever with a cantilever first end and a cantilever second end, said cantilever first end being attached to said torsional beam, said cantilever second end supporting a mirror head,

a connector attached to said torsional beam, and

a counterweight attached to said connector.

2. The optical micro-electromechanical device of claim 1 wherein said counterweight has a set of apertures formed therein.

3. (amended) The optical micro-electromechanical device of claim [1] <u>2</u> wherein a region of said substrate under said counterweight is configured as an isolation region.

4. The optical micro-electromechanical device of claim 3 wherein said isolation region is doped to provide electrical isolation between said counterweight and said isolation region.

5. The optical micro-electromechanical device of claim 3 wherein said isolation region includes a deposited passivation surface.

6. The optical micro-electromechanical device of claim 3 wherein said isolation region includes a trench to facilitate spatial isolation between said isolation region and said counterweight.

7. (amended) The optical micro-electromechanical device of claim [1] 2 configured as a laser.

12. (amended) A method of operating an optical micro-electromechanical device, said method comprising the steps of:

positioning a mirror assembly over a substrate such that said substrate and said mirror together form a Fabry-Perot cavity, said mirror [assembling] assembly including a torsional beam attached to said substrate, a cantilever with a cantilever first end and a cantilever second end, said cantilever first end being attached to said torsional beam, said cantilever second end supporting a mirror head, a connector attached to said torsional beam, and a counterweight attached to said connector; and

applying an electrical bias to said substrate so as to create an electrostatic attraction between said counterweight and said substrate, which causes said torsional beam to rotate and thereby re-position said mirror head.

13. The method of claim 12 wherein said applying step includes the step of applying said electrical bias to said substrate so as to re-position said mirror head to create a red-shift of filter wavelength.

14. The method of claim 12 wherein said applying step includes the step of applying said electrical bias to said substrate so as to re-position said mirror head to create a blue-shift of filter wavelength.

15. The method of claim 12 wherein said positioning and applying steps are performed such that said mirror assembly operates as a laser.

20. The method of claim 12 further comprising the step of isolating said counterweight from said substrate.

21. The method of claim 20 wherein said isolating step includes the step of electrically isolating said counterweight from said substrate.

22. The method of claim 21 wherein said isolating step includes the step of electrically isolating said counterweight from said substrate through doping.

23. The method of claim 21 wherein said isolating step includes the step of electrically isolating said counterweight from said substrate with a passivation surface.

24. The method of claim 21 wherein said isolating step includes the step of spatially isolating said counterweight from said substrate.

25. (amended) An optical micro-electromechanical device, comprising:

a substrate; and

a mirror assembly suspended above said substrate, <u>said substrate and said mirror together forming a Fabry-Perot cavity,</u> said mirror assembly including:

a torsional beam attached to said substrate,

a cantilever with a cantilever first end and a cantilever second end, said cantilever first end being attached to said torsional beam, said cantilever second end supporting a mirror head, said cantilever having a first length measured from said cantilever first end to said cantilever second end,

a connector attached to said torsional beam, and

a counterweight with a counterweight first end and a counterweight second end, said counterweight first end being attached to said connector, said counterweight second end being suspended above the substrate, said counterweight having a second length measured from said counterweight first end to said counterweight second end, said second length being less than said first length.

26. The optical micro-electromechanical device of claim 25 wherein the mirror head comprises distributed Bragg reflectors.

27. The optical micro-electromechanical device of claim 25 wherein the substrate comprises distributed Bragg reflectors.

29. (amended) A method of operating an optical micro-electromechanical device, said method comprising the steps of:

positioning a mirror assembly over a substrate such that said substrate and said mirror together form a Fabry-Perot cavity, said mirror [assembling] assembly including:

a torsional beam attached to said substrate, a cantilever with a cantilever first end and a cantilever second end, said cantilever first end being attached to said torsional beam, said cantilever second end supporting a mirror head, said cantilever having a first length measured from said cantilever first end to said cantilever second end,

a connector attached to said torsional beam, and

a counterweight with a counterweight first end and a counterweight second end, said counterweight first end being attached to said connector, said counterweight second end being suspended above the substrate, said counterweight having a second length measured from said counterweight first end to said counterweight second end, said second length being less than said first length; and

applying an electrical bias to said substrate so as to create an electrostatic attraction between said counterweight and said substrate, which causes said torsional beam to rotate and thereby re-position said mirror head.